WEIGHTAGE TO FORMS OF QUESTIONS

PAPER: SMA-003

UNIT	Name of Units	LA marks	SA marks		VSA marks	Objective type marks	Total marks
No. of questions		2	4		6	4	16/17
Marks alloted		9x2=18	3x4=12		1x6=6	1x4=4	40
Estimated Time (min.)	Whole paper	54	36		18	12	

Sample question

2023(June)

MATHEMATICS

PAPER-SMA-003

Transportation and Game Theory

Full marks: 40 Pass mark: 16 Time: 2 hours

The figures in the margin indicate full marks for the questions.

1. Choose and rewrite the correct answer for the following questions: 1x4=4

(a) A necessary and sufficient condition for the existence of a feasible solution to the transportation problem is

(i) $\sum_{i=1}^{m} a_i = \sum_{j=1}^{n} b_j$ (ii) $\sum_{i=1}^{m} a_i \neq \sum_{j=1}^{n} b_j$

(iii) $\sum_{i=1}^{m} a_i \leq \sum_{j=1}^{n} b_j$ (iv) $\sum_{i=1}^{m} a_i \geq \sum_{j=1}^{n} b_j$

(b) If a game does not have a saddle point then the solution offers

(i) a mixed strategy (ii) a pure strategy (iii) a pure game

(iv) non optimum

(c) A game is said to be fair if its value is

(i) 1 (ii) 0 (iii) finite (iv) infinite

(d) Hungarian method cannot be applied directly to

(i) Maximization Problem (ii) Minimization Problem (iii) infeasible problem

(iv) Unbalanced Problem

2. Answer the following questions. 1x6=6

(a)Write the standard mathematical model for the transportation problem.

(b) Write the standard mathematical model for the Assignment problem.

(c) Write some characteristics of Competitive Game.

(d) Define Two-Person Zero- Sum Game.

(e) When a Game is said to have Saddle point.

(f) Write the difference between Transportation problem and an assignment problem.

3. Answer the following questions. 3x4=12

(a) Obtain an initial basic feasible solution to the following transportation problem using the Vogel's approximation method.

	D_1	D_2	D_3	D_4	Capacity
O_1	1	2	3	4	6
O_2	4	3	2	0	8
O_3	0	6	8	6	10
Demand	4	6	8	6	24

(b) Solve the following game .What is the value of the game and is it fair game?

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	20	15	12	35
	A_2	25	14	8	10
	A_3	-5	4	11	0

(c) Find the initial basic solution for the following transportation problem by using North west corner rule.

	D_1	D_2	D_3	D_4	Total supply
A	5	3	6	2	19
B	4	7	9	1	37
C	3	4	7	5	34
Total demand	16	18	31	25	

(d) Solve the following game using dominance property.

	B_1	B_2	B_3	B_4
A_1	20	15	12	35
A_2	25	14	8	10
A_3	-5	4	11	0

4. Answer the following questions. (choose any two) : 9x2=18

(a) A Company has three cement factories located in cities 1,2,3 which supply cement to four projects located in towns A,B,C and D. Each plant can supply daily 6,1,10 truckloads of cement respectively and the daily cement requirements of the projects are respectively 7,5,3,2 truckloads. The following table depicts the transportation cost per truckloads of cement (in hundreds of rupees) from each plant to each project site. Determine the optimal distribution for the company by using U-V method so as to minimize the total transportation cost.

	A	B	C	D	Supply
Sources-1	2	3	11	7	6
Sources-2	1	0	6	1	1
Sources-3	5	8	15	9	10
Demand	7	5	3	2	

(b) Five different machines can do any of the required five jobs with different profits resulting from each assignment as given below.

Jobs/Machines	Machine A	Machine B	Machine C	Machine D	Machine E
Job1	40	47	50	38	50
Job2	50	34	37	31	46
Job3	50	42	43	40	45
Job4	35	48	50	46	46
Job5	39	72	51	44	49

Find out the maximum profit possible through optimal assignment.

(c) Derive the formula for solving any 2x2 two person zero sum game without any saddle point, payoff matrix for player A be

<table>
<tr><td rowspan="4">Player A</td><td></td><td colspan="2">Player B</td></tr>
<tr><td></td><td>B_1</td><td>B_2</td></tr>
<tr><td>A_1</td><td>a_{11}</td><td>a_{12}</td></tr>
<tr><td>A_2</td><td>a_{21}</td><td>a_{22}</td></tr>
</table>

(d)Solve graphically the game whose payoff matrix is $\begin{bmatrix} 2 & 3 & 11 \\ 7 & 5 & 2 \end{bmatrix}$